Ref. #37

454

UNITED STATES DEPARTMENT OF AGRICULTURE

BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE

Project	Date	Author

TITLE

SUBJECT—

MEMORANDUM FOREST INSECT LABORATORY, COEUR D'ALENE, IDAHO,

Re: Susceptibility Classification for Western White Pine Trees

by
W. D. Bedard
Associate Entomologist

&

T. T. Terrell
Scientific Aide

Forest Insect Laboratory
Coeur d'Alene, Idaho
April 14, 1939

INDEX NO.—

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File No. _____

Noted by _____

May 8, 1939

Mr. J. C. Evenden,

Coeur d'Alene, Idaho.

Dear Evenden:

Your letter of April 14 transmitting the report on "Susceptibility classification for western white pine trees" came in during my absence.

I am very much interested in this attempt to designate susceptibility to bark beetles in white pine. Undoubtedly there are some characteristics which make these trees attractive to bark beetles and it should be possible for us to recognize those characteristics and use them for practical marking systems. Naturally you started with Keen's classification for ponderosa pine as this serves as the most simple tool yet devised for that purpose. Although the sample you use in the illustration represents very few trees, there does seem to be a definite trend.

For further observations along this line I am going to suggest that you do not put too much emphasis on Keen's set-up but look for other characteristics which may have more weight. This classification, developed after many years of work by a number of individuals, is designed primarily for an uneven-aged tree which almost invariably occurs in pure stands. The tree you are dealing with almost always occurs in even-aged stands and usually in a dense mixture of very tolerant species. After all it is not so much a classification which you desire as it is the recognition of certain characteristics that will enable you to spot trees that will be attacked by beetles within the next few years. Such characteristics may be age or size of crown as you now emphasize, or it may be degree of competition with other trees, presence of root rot, rate of growth, or effects of drought. With some of these characteristics the difficulty of course will be to interpret the effect in tree characteristics. Rate of growth particularly for the last few years would undoubtedly be an extremely practical characteristic to use. Also it is one of the best criteria for summation of all effects. I believe you have already done something with this feature and have found that there is a fair degree of correlation.

Another characteristic which it is difficult to use in practice but which we have found of considerable significance on sample plots of hardwoods is the time of opening of the buds and appearance of the first foliage in the spring. The buds are often delayed and the foliage short and of poor color in those trees which will die in the next year or two.

It will be well to give continued thought to this problem and accumulate as much data as possible.

Sincerely yours,

F. C. Craighead,
In Charge
Forest Insect Investigations

fcc-glw
cc Keen

File No. _____
Noted by JMW

Refer to file
Studies T-3

Forest Insect Laboratory
Coeur d'Alene, Idaho
April 14, 1939

Dr. F. C. Craighead

Washington, D. C.

Dear Dr. Craighead:

I am enclosing a memorandum which is signed by Mr. Bedard and Mr. Terrell but with which we have all had a great deal to do. This memorandum depicts the development of a susceptibility classification for western white pine and brings what data we have available up to the present season. For the past few years we have had this task in mind and have accumulated what information we could in connection with our other white pine study projects.

We fully realized that the development of this susceptibility classification was not going to be an easy task, and our experience so far has not changed this reaction. Our difficulty rests in the fact that, first, we are dealing with even-aged stands and, second, that for the most part our trees are dominant and codominant, with very few intermediate and suppressed trees. As a result we are obliged to start on the basis that in a given area the trees under consideration are of the same age classification and with approximately the same degree of crown dominance. Although diameter is an indication of radial growth within even-aged stands, there does not seem to be any relationship whatever between radial growth and trees selected by the mountain pine beetle for attack.

As will be seen, we have predicated our classification upon Keen's system for ponderosa pine, which forms undoubtedly the very best basis possible. We have used crown volume as our indication of individual tree vigor, and although it will be seen from the memorandum that there is a grouping of infested trees in the poorer crown classes, these correlations are not overly significant. It is recognized that we do not have a lot of data, a condition which we hope to overcome during the present season.

We believe that we as individuals can go into a white pine stand and select with a very fair degree of accuracy the trees that are most susceptible to attacks of the mountain pine beetle. This decision would be based primarily upon our experience and the reaction which one secures

from each tree. These reactions are difficult to explain, and when an attempt is made to put them into writing it is found that the descriptions are very inadequate.

The necessity for a classification of white pine susceptibility to the attacks of the mountain pine beetle is emphasized by a cooperative study proposed by the Forest Experiment Station. Our survey data are convincing forest officers that in the marginal white pine stands of mature trees the annual losses are so severe as to leave in a very few years forests of different composition and of inferior species. In a large area of the white pine experimental forest, Coeur d'Alene National Forest, a salvage logging operation is proposed, at which time an attempt will be made to cut all white pine trees that are in danger of being attacked during the next decade. We realize that this will be a difficult task and that, aside from the actual selection of trees, there will be other factors that must be considered. For instance, we know very little as to the degree which white pine canopies can be opened without seriously affecting normal environmental conditions causing otherwise resistant trees to become more susceptible to insect attack. This project will be started, I am quite sure, some time during the early summer, and during the course of the next few years we should obtain interesting and valuable data concerning this phase of white pine management.

We would be pleased to have your reaction to our attempt to establish a susceptibility classification, as well as the proposed study with the Forest Experiment Station.

Respectfully yours,

JAMES C. EVENDEN
Senior Entomologist

Enclosure

cc to:
Mr. Miller
Mr. Keen ✓
Dr. Beal

Forest Insect Laboratory
Coeur d'Alene, Idaho
April 14, 1939

Memorandum Forest Insect Laboratory, Coeur d'Alene, Idaho,

Re: Susceptibility Classification for Western White Pine Trees

In the spring of 1938 two seasons' field records were used to prepare a classification for western white pine according to susceptibility to mountain pine beetle attack. At that time it was stated that the classification was purely tentative and intended only for use by the Coeur d'Alene Laboratory officers, until revisions and improvements could be made and complete testing had proved its suitability for general use. Although the work is yet incomplete and considerable more testing needs be done under a wider range of conditions, an immediate demand for a selective marking in western white pine necessitates a summation of the work to date. It is to be understood, however, that the accuracy of this classification has not been proved and that it is being submitted primarily for criticisms and suggestions.

Tentative Classification for Western White Pine

Similar to Mr. F. P. Keen's system for ponderosa pine, tree age and tree vigor form the basis for the classification in which four relatively broad age classes are used starting with trees 80 years old and continuing in 40-year age groups as follows:

Class I - 80 to 120 years

Class II - 121 to 160 years

Class III - 161 to 200 years

Class IV - 200+ years

Each of these four age classes is further subdivided into four vigor classes based on crown volume, that is, the actual amount of foliage in relation to the size of the tree. As the average width of white pine crowns is about 1/8 of the tree's height, the crown volume is secured by visually dividing the bole of the tree into four parts (figure 1), each one of these sections representing 2/8 of the tree's bole. In making this determination, it is necessary that the tree be examined from two sides representing the greatest and least amount of crown. Crowns that are wider than 1/8 are given a value to compensate for the greater width, such as that shown in figure 1, which would be considered as 3/8 coverage. After the length and width have been determined, the density of the crown must be ascertained as being normal, above or below normal. If above normal, 1/8 is added to the coverage, or if below normal in density, 1/8 is deducted from the coverage. Thus if a tree as in figure 1 shows 3/8 coverage with below average density, 1/8 of the coverage is deducted, which will give the tree a 2/8 crown volume or coverage class.

Fig. 1

The four vigor classes are tabulated as A, B, C, or D, and include the crown volumes shown in the following table:

Class	Crown volume or coverage		
A	6/8	7/8	8/8
B	4/8	5/8	
C	2/8	3/8	
D	1/8		

By this classification trees may be placed into a 16-way square for tabulation:

I - A B C D

II - A B C D

III - A B C D

IV - A B C D

Application of the Susceptibility Classification

During the 1938 season, 71 infested and 135 uninfested trees were classified according to the tentative system outlined in the preceding section. Table I shows the distribution of these green and infested trees as well as the percent infested, according to the different age and crown density classes. A graphic presentation of these data is also shown in plate I.

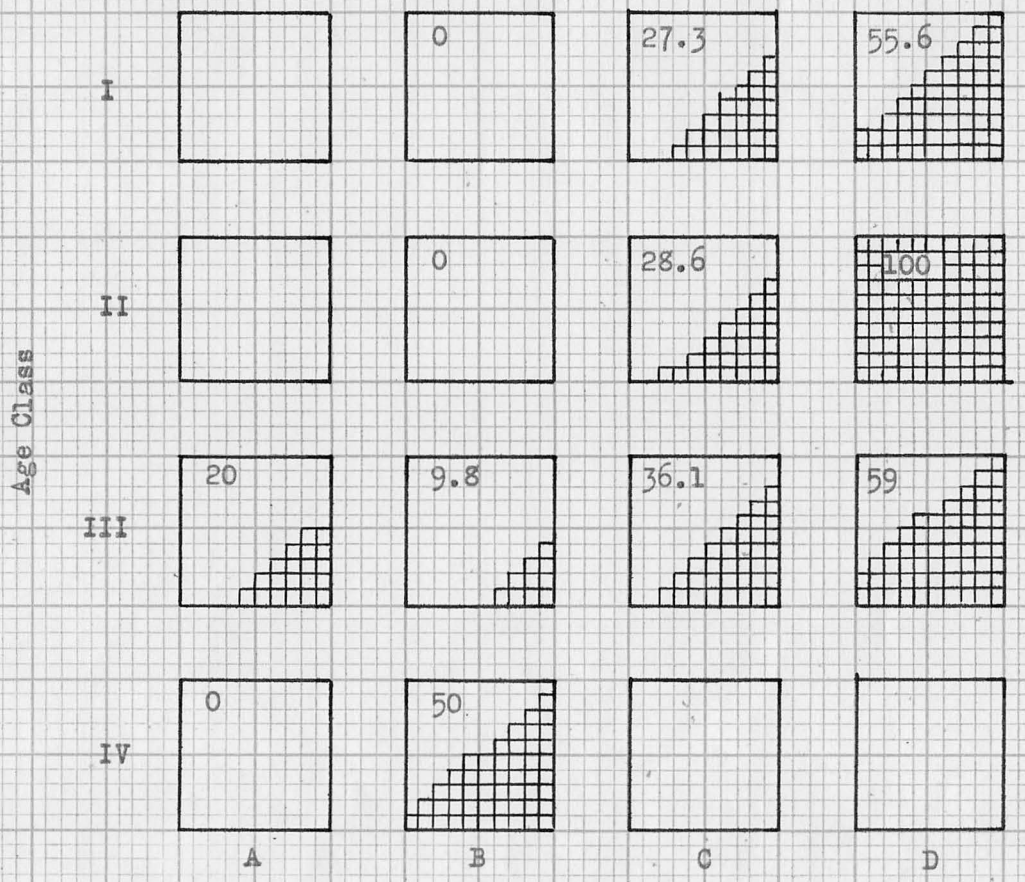
TABLE I

DISTRIBUTION OF GREEN AND INFESTED TREES ACCORDING TO CLASSIFICATION

Age class	Trees	Crown density class A	B	C	D
I	Total		6	22	18
	Infested		0	6	10
	Percent infested		0	27.3	55.6
II	Total		2	7	2
	Infested		0	2	2
	Percent infested		0	28.6	100
III	Total	5	41	61	39
	Infested	1	4	22	23
	Percent infested	20.0	9.8	36.1	59.0
IV	Total	1	2		
	Infested	0	1		
	Percent infested	0	50.0		

PLATE I

PERCENT TREES INFESTED ACCORDING TO AGE AND CROWN CLASS



It is at once apparent that the proposed classification has considerable merit. Although the samples representing the various groups are inadequate, there is an obvious concentration of infestation in crown density classes "C" and "D". It is also believed that if proper samples were obtained there would be a concentration of infestation in age classes II and III, so that most infested trees would fall in classes IID, IIID, IIIC and IIIC. Representatives in classes "IA" and "IIA" would be difficult to find because in these younger stands competition is so keen that greatest energy is put into height rather than crown volume. Representatives in classes "IVC" and "IVD" would likewise be difficult to find because in these older age groups most of the sparsely crowned trees have been eliminated.

Future Work

The proposed selective marking on the Deception Creek Experimental Forest will test the classification in actual application. The factor of site, however, will play a dominant part in this area and must be recognized.

In addition to this practice marking, many more classified trees are necessary, not only to secure proper representation in the various age and crown classes, but to determine the percent infestation in different site moisture classes. It is planned that in addition to the infested and green trees classified by the infestation

study, the white pine survey will procure information concerning the percent infestation in age and site moisture classes. The survey will also classify green and infested trees. Finally, when time is available, green and infested trees will be classified in selected age classes in order to be certain of a good representation in all classes.

Respectfully submitted,

W. D. BEDARD, Associate Entomologist

T. T. TERRELL, Scientific Aide